IMPACT OF PEDAGOGICAL CONTENT KNOWLEDGE OF TEACHERS ON PEDAGOGICAL TRANSITIONAL PROBLEMS OF UNDERGRADUATE STUDENTS

A
SYNOPSIS
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INTRODUCTION

"Any enlightened human being can be created by the teacher through providing two unique characteristics. One is building capacities among the students to inquire, to innovate, be creative and moral leadership; second is the development of social value system."

[Kalam, A. P.J., 2008]

Over the last decade, teachers' knowledge and teachers' thought process is considered as a rich and growing research area in the field of teacher education, this is because teachers play most important role in enabling students to take their own decisions by involving in a complex and cognitive demanding process such as problem solving process, decision making process etc. It is necessary to have knowledgeable teachers, who know not only about learners' prior knowledge for the topic and use of instructional strategies [Aydin, 2012], but should also understand about the challenges and needs of learners in social, emotional and academic context when they are in transitional phase.

Some Researchers [Little, 1993; Hammond and McLaughlin, 1995; Fishman et al., 2003] suggested that curriculum reform can be seen as a possible solution to these educational problems as new curriculum focuses on incorporating different kind of teaching and assessment procedures. So, teachers feel difficulties to reflect new curricula to their method of teaching [Aydin and Cakiroglu, 2010]. Thus, reform in curricula alone cannot be a possible solution, search of expert pedagogue is also necessary to understand how to organize and conceptualize the teaching for enhancing students' understanding of the concepts [Loughran et al., 2000]. This expert pedagogue must have a unique Pedagogical Content Knowledge which contains content, content teaching tactics, learning manner and theories.

1. PEDAGOGICAL CONTENT KNOWLEDGE

Shulman (1986) conceptualized Pedagogical Content Knowledge (PCK) as strongest analogies, explanations, elucidations, demonstrations and examples - in single word, the way of depicting

and expressing the Subject Systematically that makes it understandable for learners. PCK is a unique blending of different components *viz*. content knowledge, pedagogical knowledge and knowledge of student learning [Figure-1].

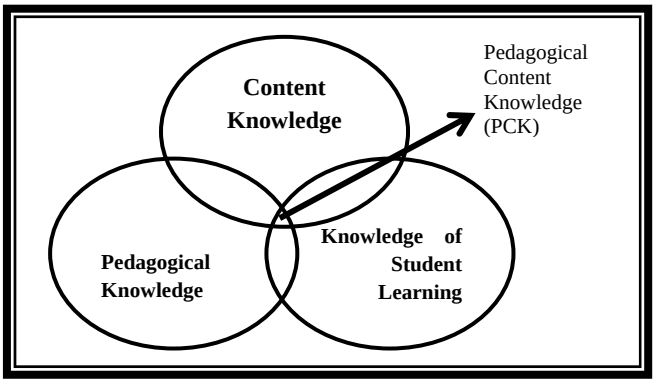

Figure 1: Exhibiting the different components of Pedagogical Content Knowledge

Loughran et al. (2000) stated that PCK is a unique mixture of interacting elements that combine and help in providing insight to PCK. Howsoever, as the blending of elements constantly differs, PCK is also a variable in that. The different types of fusions of elements affect the richness of PCK. The author identified 12 elements [1) Views of learning, 2) Views of teaching, 3) Understanding the content, 4) Knowledge and practice of children's science/ alternative conceptions, 5) Time-teaching time/length of unit/unit of work, 6) Context school, classroom, year level, 7) Understanding of students, 8) Views of scientific knowledge, 9) Pedagogical practice, 10) Decision making, 11) Reflection, 12) Explicit vs. tacit elements of knowledge of practice/ beliefs/ ideas] of PCK [Figure-2].

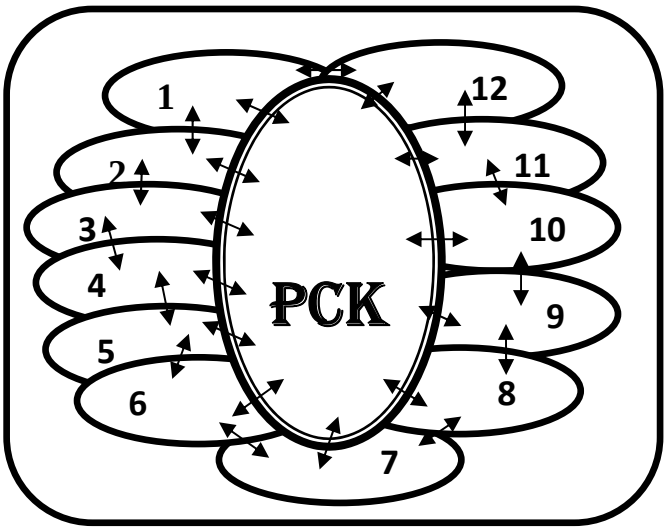

Figure 2: Exhibiting the interaction among different elements of PCK

KNOWLEDGE DOMAINS OF PCK

Shulman (1986) suggested that PCK is one of seven knowledge domain needed for the process of teaching. [Figure-3]

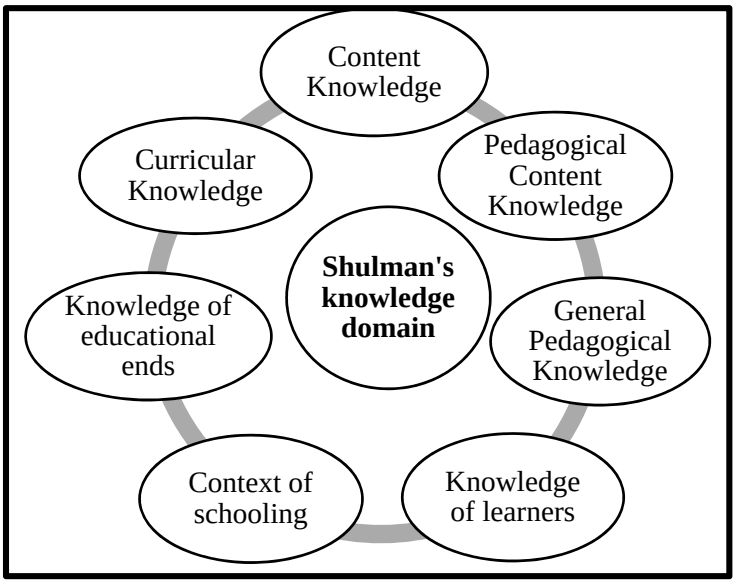

Figure 3: Exhibiting PCK as one of seven knowledge domains as categorized by Shulman

Whereas Grossman (1990) argued that PCK is derived from four knowledge domains *viz.* Knowledge of students' understanding, Curricular Knowledge, Knowledge of instructional strategies, Conceptions and purpose of teaching. [Figure -4]

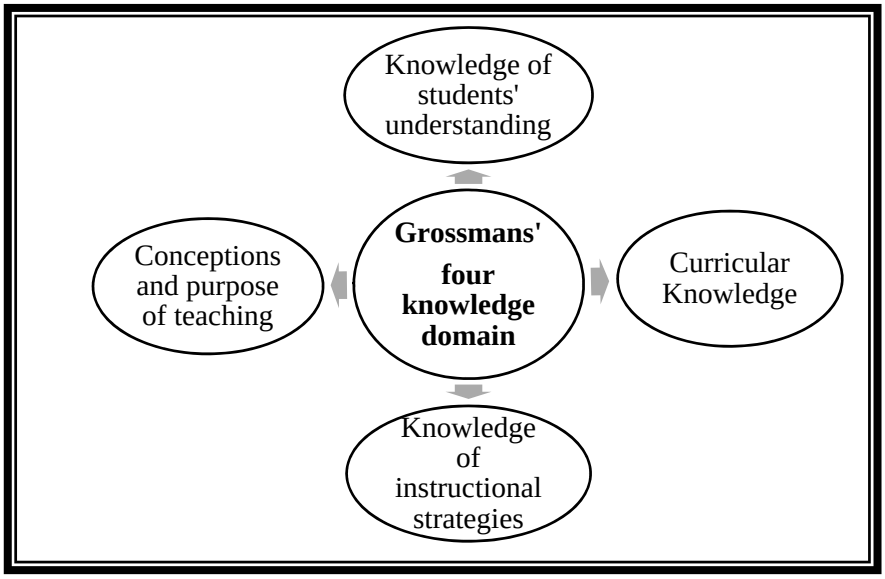

Figure 4: Exhibiting four knowledge domains of PCK as categorized by Grossman

2. PEDAGOGICAL TRANSITION

Pedagogical transition is referred to as moving from one grade level to another grade level or moving from school to post school settings. When students' progress through different grade level they face many challenges like change in academic, social, physical and emotional context, even though, students are repeatedly bounded in the process of familiarizing to novel challenges. Teachers and professionals of mental health have same opinion that certain risky transitional points can be stressful and need distinctive support and understanding to cope effectively with those problems. At University level, there is need of some strategies which can bridge the pedagogical transitional gap and increase the academic, administrative and support areas for providing rich first year experience to students in a systematic and holistic way.

LITERATURE REVIEW

A) RESEARCH STATUS OF PEDAGOGIACAL CONTENT KNOWLEDGE-

Pedagogical Content Knowledge (PCK) is a powerful construct to guide researchers and teacher educators in terms of which type of knowledge teachers have (Friedrichsen, 2008). Shulman (1986) introduced the concept of PCK in the field of teacher education and stated that teachers should have content knowledge of subject matter, pedagogical knowledge of subject matter and curricular knowledge. Shulman stated that PCK is a unique knowledge needed to transform several types of knowledge required for teaching and identified Subject matter content knowledge as a distinct component of it. Magnusson et al. (1999) have adopted the Shulmans' idea unambiguously and commented that PCK is the transformation of several forms of knowledge for teaching (including subject matter knowledge) and symbolizes a specific domain needed for teachers' knowledge. In contrast, Marks (1990) argued that pedagogical content knowledge and content knowledge cannot be clearly distinguishable knowledge components. Cochran et al. (1993) also agreed with it and stated that teachers' PCKg develops with time due to progressive awareness of students' need. Fernandez Balboa and Stiehl (1995) also obtained equivalent results to Marks in University lecturers. Koballa et al. (1999) also concluded the same by the data gathered from trainee chemistry teachers of German gymnasium schools. Veal and MaKinster (1998) gave a hierarchy of knowledge contributing to development of teachers' PCK. It ranges from lowest General PCK followed by Subject specific PCK, Domain specific PCK to Topic specific PCK. Theoretical studies about interaction and interplay of PCK's component have been studied repeatedly like Loughran et al. (2000) identified 12 interactive elements of PCK. Padilla et al. (2008) investigated four university teachers in general chemistry to reveal the ways by which each professor conceptualizes his/her teaching amount of substance. Halim and Meerah (2002) investigated twelve pre service teachers from diverse background of science degree and found that most of the trainees had misunderstanding same as students of school. They asserted that rich content knowledge is mandatory for developing comprehensive PCK. Vandriel et al.

(2002) and Dejong et al. (2004) examined pre service chemistry teachers engaged in macro-micro shift and found that university based workshops and quality mentoring is helpful to become attentive to their inclination to bounce between macro and micro levels. Geddis et al. (1993) compared the novice and experienced teachers in their research on chemistry teachers teaching about isotopes. They concluded that teachers need an extensive range of knowledge types to transform subject matter knowledge to students. Angell et al. (2005) compared PCK of expert and novice teachers in different content area in physics. The results revealed the experts made wide linkages between knowledge of different contexts and showed a worthy group of pedagogical skills in contrary to novice teachers concentrated on transmitting content. In Indian perspective, PCK is not determined as a highly investigated research area. Mostly researches have been done on teachers' knowledge which suggested various teaching skills, teaching methods. Few researches are found that can be considered in context of PCK such as Yadav (2012) developed a SSA Inset training packages, Jagtap (1999) stated in his study "Content cum Methodology" that content representation is must for empowering a teacher. Verma and Chabra (1996) found a causal relationship of pedagogical knowledge with variables skills and classroom process. However, very little amount of work has been done on pedagogical content knowledge.

B) RESEARCH STATUS OF PEDAGOGICAL TRANSITION-

Pedagogical transition is considered as a rich and challenging research area in teachers' education. Some reports are available for suggesting the way of efficient pedagogical transition such as Ontario Ministry of Education (Hargreaves and Earl, 1990), Community Health Systems Resource Group (Ferguson et al., 2005), Understanding India: the future of higher education and opportunities for international cooperation (Heslop, 2014). Galton et al. (2003) recognized transition as a stumbling point for most students, particularly for those who are at risk of early school leaving and concluded that tensions and pressures in school and in transition can lead pupils to implement a specific identity in relation to their learning. Crabtree and Roberts (2007) made efforts to understand the transitional problems in higher education and found that the result

of their study was likely to be of interest to those involved in first year undergraduates, irrespective of subject or discipline of study. Researches revealed that transitional phase can be stressful. Tilleczek (2007) proposed that an emotional paradox occurs in transitional phase. Students are both enthusiastic and nervous, and both expectant and suspicious at the same time. Kvaslund (2000) stated that being separated from friends was “Dreaded” for students in all type of schools. In contrast, Pietarinen (2000) reported that students were hopeful to the transition to offer a societal success with fresh and enduring friendship that would relocate with them. Kirkpatrick (2004) also reported that students looked forward to a “fresh start” with greater challenges and opportunities to find new friends and studying new subjects. Akos (2004) also stated the same that a lot of students considered the transitions as comparatively easy. In India, articles are available concerning to issues, challenges and suggestions for higher education in India (J.D. Singh, Tilak, 2012; Desai and Kulkarni, 2008; report of CABE) which focus on problems of higher education like quality, lower enrolment rate, outmoded teaching method, declining research standards etc. Position paper of NCERT on Teaching of Science (2006), Indian education report of NCEE (Cheney et al., 2005), document of UNICEF on School readiness and transition (2012) and Review paper by Biswal (2011) are also made a significant contribution for elementary and secondary schools, but review literature reflects that transition to higher education not so much focused.

PROPOSED WORK

The proposed work of the present study is divided into following heads:

1) MOTIVATION FOR THE PRESENT STUDY

After reviewing the literature, it was observed that there is a need to focus on pedagogical transition problems, as these are considered as major problem in global perspectives.

In higher education, pedagogical transition results in low academic achievement, stress level, raise anxiety, adjustment problems as a wide gap is seen between teachers' knowledge and students' expectations and experience. Pedagogical Content Knowledge, a strong construct for teachers to enhance their knowledge and professional growth, can be a possible solution to bridge the pedagogical transitional gap, this is because teachers' knowledge can provide assistance to students for understanding and using concepts, to attain particular skills and to develop values, attitudes and interests for achieving educational objectives related to cognitive domain, affective domain and psychomotor domain. Thus, teachers are the most crucial factor of teaching learning environment. They are executives of their classroom and directly interact with students. They can understand the need and problems faced by the students and can provide help with a sense of belonging and care to overcome these problems, accordingly. Teachers' pedagogical content knowledge or knowledge about content, instructional material, classroom context, social context, knowledge about learner needs can affect pedagogical transition directly or indirectly. Thus, pedagogical content knowledge of teachers can be helpful to bridge pedagogical transitional gap. In this research work the impact of developed Pedagogical Content Knowledge Framework will be evaluated with an emphasis on Pedagogical Transitional problems of undergraduate students.

2) STATEMENT OF THE PROBLEM

IMPACT OF PEDAGOGICAL CONTENT KNOWLEDGE OF TEACHERS ON PEDAGOGICAL TRANSITIONAL PROBLEMS OF UNDERGRADUATE STUDENTS

3) OPERATIONAL DEFINITION OF THE TERMS

The operational definitions of the utilized terms in the present study are as follow:

A) PEDAGOGICAL CONTENT KNOWLEDGE

Pedagogical Content Knowledge represents "the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (Shulman, 1987). In the present context of the study, Pedagogical Content Knowledge (PCK) is considered as a unique fusion of Content knowledge and General pedagogical knowledge for teaching different topics in graspable manner to learners.

B) CONTENT KNOWLEDGE

Content Knowledge is knowledge of content related to a unique field that includes substantive and syntactic components. The substantive covers the knowledge of rules, facts, principles, concepts and theories in a specific field of science while the syntactic component compasses knowledge of the process through which knowledge is generated in the field [Tamir, 1988]. In this present study, the teachers' knowledge of content belonging to Biology field that includes substantive and syntactic components is considered.

C) GENERAL PEDAGOGICAL KNOWLEDGE

General Pedagogical Knowledge is belonged to teaching process but this is not specific to any field such as Math teaching or Geography teaching. It includes general knowledge of teacher about teaching tactics, need of learners, classroom management and communication with learners etc.

D) PEDAGOGICAL TRANSITION

It is a guiding philosophy that carefully scaffolds and intercede the experience of learning for those diverse cohorts who are moving from one grade to another grade level or school to post

school settings. In the present context of the study, transition of students from higher secondary level to university level is termed as pedagogical transition.

E) UNDERGRADUATES

Undergraduate means a student at a college or university who has enrolled in a bachelor program but has not received the bachelor degree yet. In the present study, undergraduates who have got admission in first year degree course of college and opted Biology group as subjects, is determined as first year Biology undergraduates.

F) FRAMEWORK

Framework is a real or conceptual structure for supporting or enclosing something else, especially a skeletal used as the basis for something being constructed. In the present study, a framework based on Pedagogical Content Knowledge to bridge the pedagogical transition will be developed.

4) OBJECTIVES OF THE STUDY

The objectives of the study are as follows-

1) To identify problematic transitional gap areas for First Year Biology Undergraduate Students on the basis of Christopher Lovelock's 7- Gaps Model.
2) To find out Biology Teachers through Analytical Hierarchical Process.
3) To assess the Pedagogical Content Knowledge of Biology Teachers.
4) To develop the Pedagogical Content Knowledge Framework for bridging Pedagogical Transitional Gap of First Year Biology Undergraduate Students.
5) To implement the developed Pedagogical Content Knowledge Framework on First Year Biology Undergraduate Students.
6) To assess the impact of developed Pedagogical Content Knowledge Framework through feedback of Biology Teachers and First Year Biology Undergraduate Students on Pedagogical Transitional Gaps.

5) HYPOTHESIS OF THE STUDY

The first four objectives are associated with the Pedagogical Content Knowledge Framework development, thus no need to be hypothesized. The sixth objective is related to experimental tryout of the developed framework and the hypothesis associated to this objective is as following:

Ho.1: *There will be no significant difference in pedagogical transitional gaps between both the groups i.e. Control and Experimental groups, as a result of Pedagogical Content Knowledge Framework.*

6) METHOD OF THE STUDY

The present research is a hybrid research method which will include qualitative research and some elements of quantitative research. [Figure-5]

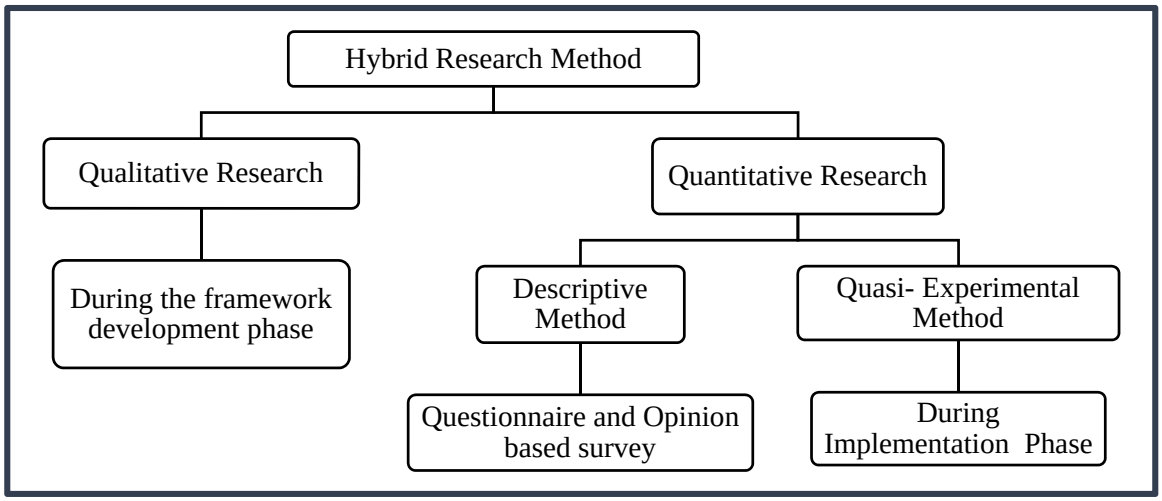

Figure 5: Exhibiting the method of the study

7) PROCEDURE OF THE STUDY

The framework will be developed in accordance with the following steps [Figure – 6].

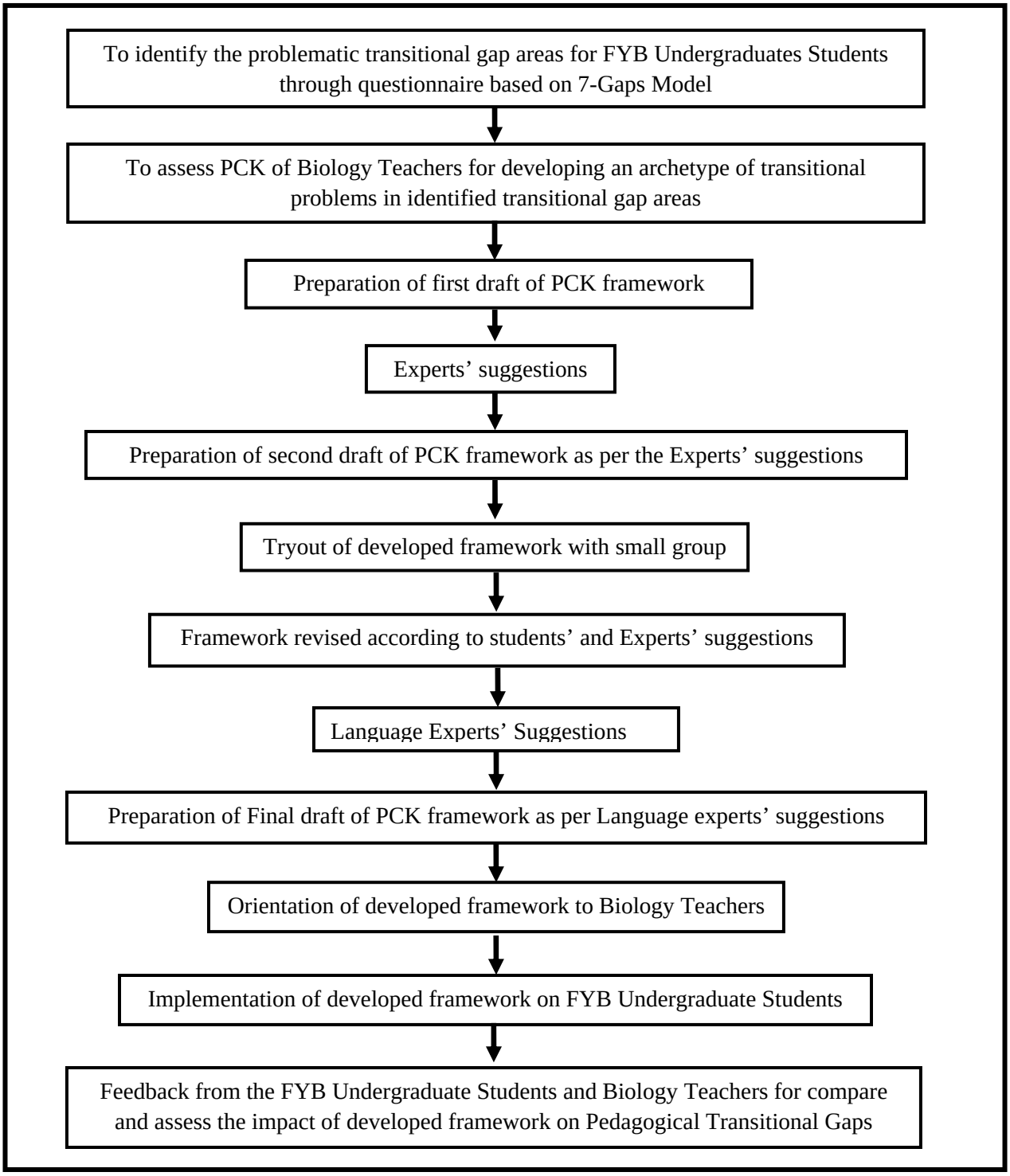
To identify the problematic transitional gap areas for FYB Undergraduates Students through questionnaire based on 7-Gaps Model
To assess PCK of Biology Teachers for developing an archetype of transitional problems in identified transitional gap areas
Preparation of first draft of PCK framework
Experts' suggestions
Preparation of second draft of PCK framework as per the Experts' suggestions
Tryout of developed framework with small group
Framework revised according to students' and Experts' suggestions
Language Experts' Suggestions
Preparation of Final draft of PCK framework as per Language experts' suggestions
Orientation of developed framework to Biology Teachers
Implementation of developed framework on FYB Undergraduate Students
Feedback from the FYB Undergraduate Students and Biology Teachers for compare and assess the impact of developed framework on Pedagogical Transitional Gaps

Figure 6: Exhibiting the procedure of the study

A) IDENTIFICATION OF PROBLEMATIC TRANSITIONAL GAP AREAS-

Problematic transitional gap areas for FYB Undergraduate Students will be identified through questionnaire based on Christopher Lovelock's 7-Gaps Model. In the present study, the data will be gathered from it, will be considered as data gathered from Control group.

B) DEVELOPING AN ARCHETYPE OF PEDAGOGICAL TRANSITIONAL PROBLEMS IN IDENTIFIED TRANSITIONAL GAP AREAS -

An archetype will be developed for pedagogical transitional problems of first year biology undergraduates (FYB) in identified transitional gap areas, before developing the framework. This will be done by assessing the Pedagogical Content Knowledge of Biology Teachers.

C) DEVELOPMENT OF THE FRAMEWORK-

a) **Preparation of the first draft of Pedagogical Content Knowledge Framework:**

   First draft of Pedagogical Content Knowledge Framework will be prepared on the basis of data gathered through assessment of PCK of Biology Teachers during the development of archetype.

b) **Experts' suggestions:**

   This will help in the development of the framework. In the present study, Expert Biology Teachers and teacher educators (Biology teaching) will be considered worthy.

c) **Preparation of the second draft of framework:**

   First draft of Pedagogical Content Knowledge Framework will be revised according to expert and teacher educators' suggestions and after revision second draft of framework will be prepared.

d) Small group try out:

The prepared framework will be tried out on a small group of Biology Teachers and First Year Biology Undergraduate Students and will be revised according to Students' and Expert's suggestion.

e) Language Experts' suggestions-

Language Experts' suggestions will be taken on the developed framework for examining the language of developed framework.

f) Final draft of framework:

Final draft of Pedagogical Content Knowledge Framework will be developed with accordance to results, suggested revision of small group try out and suggestions of Language Experts.

g) Orientation for teachers:

An orientation of Pedagogical Content Knowledge Framework will be provided to the selected Biology Teachers for implementing Pedagogical Content Knowledge Framework on large group of students.

h) Implementation of developed framework:

Developed framework will be implemented by the selected Biology Teachers on First Year Biology Undergraduate Students. The group on which this framework will be implemented, will be considered as Experimental group in the present study

i) Feedback from the FYB Undergraduate Students and Biology Teachers:

Feedback will be collected as follows:

1. Feedback will be collected from FYB Undergraduate Students to compare and assess the impact of Pedagogical Content Knowledge Framework on Pedagogical Transitional gaps.

2. Feedback will be collected from Biology Teachers to evaluate the efficacy of developed framework for them.

8) SAMPLE OF THE STUDY

The sample of the study will be divided into two groups-

a) Sample for Selection of Experts-

Biology Teachers and Teacher Educators of Biology teaching will be selected through Purposive Sampling from Dayalbagh Educational Institute and Aided colleges affiliated to Dr. B. R. Ambedkar University in Agra and out of them 15 Experts (including Biology Teachers and Teacher Educators of Biology teaching) will be selected through Random Sampling in the present study.

b) Sample for selection of FYB Undergraduate Students for development and validation of PCK framework:

This sample will be selected by following method [Figure-7]

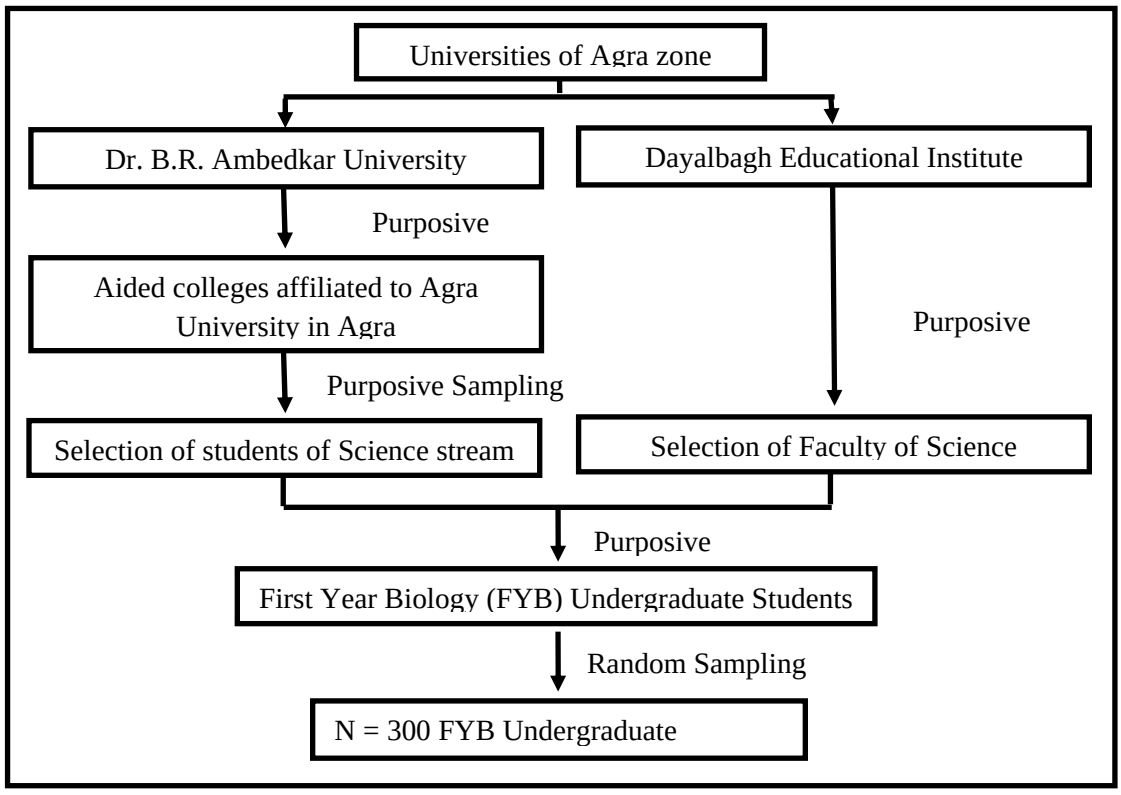

Figure 7: Exhibiting the sample selection of FYB Undergraduate Students

9) VARIABLES OF THE STUDY

The variables of the study have been classified as following:

Independent variable - Pedagogical Content Knowledge Framework

Dependent variable – Pedagogical Transition

Control variable – Medium of instruction in previous education, previous qualification, General environment, content etc.

10) TOOLS FOR THE STUDY

Following tools will be used in present study:

1. 7-Gaps Model by Christopher Lovelock (1994).
2. Self-constructed Questionnaire for identifying pedagogical transitional problems of FYB Undergraduate Students.
3. Observation and interview to assess Pedagogical Content Knowledge.
4. Self-constructed tool for obtaining feedback from students and Biology Teachers to evaluate impact of Pedagogical Content Knowledge Framework on Pedagogical Transition.
5. Parametric and Non-Parametric statistical analysis and decision making tools, like- Analytical Hierarchical Process (AHP) will be used.

11) DELIMITATIONS OF THE STUDY

Due to limited time and resources, the present study will be delimited in following respects:

A) **Regional area-** Agra zone will be selected for the present study.

B) **Institutional area-** Experts and Students from Dayalbagh Educational Institute and Government or aided college of Dr. B. R. Ambedkar University, Agra will be selected for the present study.

C) **Educational level –** First year Undergraduate Students of Biology will be selected for the study.

D) Stream- Only undergraduates of Biology group will be considered for the present study.

SIGNIFICANCE OF THE STUDY

The research may help in understanding the association between teachers' Pedagogical Content Knowledge and pedagogical transition in higher education and can also be helpful in developing a framework for bridging the pedagogical transition gap. The present research will explore the content knowledge, pedagogical knowledge of teachers and students' problems in pedagogical transitional phase. This study will help on to smoothing the phase of transition. Teachers' Pedagogical Content Knowledge influences the psychological state of mind this in turn reflects in their attitude towards the students' problems which they face during transitional period. The current research approach will assess the PCK of teachers at different levels viz. self-assessment by the teacher and assessment by the researcher and students. The present study will provide beneficial insight to describe the teachers' way to utilize PCK components to compose the topic more comprehensible to learners and in solving the various problems of learners. The present research will also contribute in the field of Pedagogical Content Knowledge and pedagogical transition at university level.

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